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(54) Title: MATERIAL FOR HUNTING AMMUNITION, AND A METHOD FOR PRODUCING SUCH MATERIAL

(57) Abstract

The invention is characterized in that the ammunition material comprises at least one of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form and a material of low melting point which functions to bind the powder material to a coherent body; in that the powder material and the binder material is present in the ammunition material in such mutual proportions that the ammunition material has a density which corresponds to or is in the same order of magnitude as the density of lead. The invention also relates to a method for manufacturing the ammunition material.

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Material for Hunting Ammunition, and a Method for Producing Such Material

The present invention relates to hunting ammunition material. Hunting ammunition is normally produced from lead, which applies both to ball ammunition and to so-called BB-shot or pellet ammunition.

The use of lead, particularly lead shot or pellets, for hunting purposes is highly disadvantageous from an environmental aspect. About 700 tonnes of lead is scattered annually in this way over the countryside in Sweden alone, of which about 125 tonnes derives from shooting and hunting. About 20 tonnes of lead shot is scattered in conjunction with bird shooting expeditions, this shot falling in places where the birds are liable to ingest the shot when scavenging for food, e.g. over wet-lands.

When using lead shot or pellets for hunting purposes, a very large quantity of lead is scattered throughout the countryside in an uncontrollable fashion, which is negative from an environmental aspect.

One particularly negative aspect of the use of BB lead shot to shoot birds is that the shot is scattered in a manner which results in some of the shot being eaten by the birds and causing lead poisoning. Naturally, this can lead to the death of certain birds. Moreover, people who, in turn, eat birds which have eaten lead shot will also ingest a certain amount of lead.

On the other hand, lead ammunition has very good ballistic properties and also high energetic properties, in other words lead shot produces a satisfactorily high energy impulse when striking the target. These properties are allied to a great extent with the specific gravity of lead, i.e. its density.

It would also seem that those weapons used for hunting purposes are designed and dimensioned for use with lead ammunition.

Iron ammunition in the form of iron shot is available commercially. The density of iron, however, is too low to provide the same good properties as lead, and consequently iron shot has a limited use.

It will be evident, however, that it would be highly beneficial to replace lead with a material whose properties correspond to those of lead in this context but in this context at the same time is harmless to the environment and ecosystem.

The present invention proposes a material which can be used as a substitute for lead in shot ammunition and also in ball ammunition.

Thus, the present invention relates to material for hunting ammunition and is characterized in that the ammunition material includes at least one of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form, and a material of low melting point which functions to bind the powder material into a coherent body; in that the powder material and the binder material is present in the ammunition material in such mutual proportions that the ammunition material has a density corresponding to or in the same order of magnitude as the density of lead.

The invention also relates to a method of manufacturing such a material, this method mainly comprising the features set forth in Claim 6.

The invention will now be described in more detail, partly with reference to exemplifying embodiments of the invention.

The present invention thus relates to a material for the manufacture of hunting ammunition. The ammunition material comprises at least one of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form, and a material of low melting point which functions to bind the powder material to form a coherent body.

The powder material and the binder material is present in the ammunition material in mutual proportions such that the ammunition material will have a density which corresponds to or is of the same order of magnitude as the density of lead.

Because the ammunition material has a density which corresponds to or is in the same order of magnitude as the density of lead, the ammunition will possess the same or corresponding ballistic and energetic properties as lead ammunition.

According to one preferred embodiment of the invention, the binder material is comprised of at least one of the materials zinc (Zn), tin (Sn) or aluminum (Al), which function as a sintering material. These materials have a low melting point in comparison with ferrotungsten (FeW) and tungsten carbide (WC), therewith enabling a known sintering process to be readily employed. The sintering material is preferably in powder form prior to the sintering process.

According to another preferred embodiment, the binder material is a plastic material, preferably a polyester plastic. In this case, the metallic powder material is mixed with the plastic material to obtain an homogenous mixture. The mixture is then placed in moulds in which individual shot or balls are shaped and the plastic material then allowed to cure.

Low density and high density ammunition is already known to the art.

According to the present invention, both low density ammunition and high density ammunition can be produced.

According to one embodiment of the invention, the ammunition material of low or average density comprises tungsten carbide and zinc, preferably in about equal volumes.

Lead has a density of 11.3 g/cm^3. Tungsten carbide (WC) has a density of 14.3 g/cm^3. A mixture comprising 50 vol. % WC and 50 vol. % zinc (Zn) has a density of 10.7 g/cm^3.

According to one embodiment of the invention, the high-density ammunition material comprises ferrotungsten and zinc, preferably with about 75 vol. % FeW and 25 vol. % Zn. This mixture has a density of 16.3 g/cm^3.

It will be obvious that the skilled person will be able to mix the aforesaid materials or other materials in chosen proportions which will provide ammunition of the density desired, and the present invention is not therefore restricted to any particular mixture.

As before mentioned, the invention also relates to a method of producing said ammunition.

According to the invention, the ammunition material is produced by mixing at least one of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form with a material of low melting point, melting the material of low melting point and then causing said material to solidify so as to sinter together the powder material.

The powder material and the sintering material are present in such mutual proportions that the ammunition material will have a density which corresponds to or is of the same order of magnitude as the density of lead.

The sintering process can be effected by means of suitable, well-known methods, of which one is to place the mixture in moulds for producing individual shot or balls, and to heat the moulds to sintering temperature and then allowing the moulds to cool. Subsequent to the sintering process, the shot or balls may be subjected to deformation with the intention of increasing the compactness, i.e. increasing the density.

According to one particular method, the mixture of powder material and sintering material is, instead, subjected to a high speed moulding process so that an adiabatic process will take place where the sintering material melts.

By adiabatic process is meant that deformation takes place at such a high speed that the thermal energy generated in the process of deformation cannot be lead away in time, but remains essentially in the material that is deformed. In this regard, the deformation energy must also be sufficiently high to melt the sintering material to the extent desired.

A process of this kind can be carried out by placing the mixture in a first, open mould half for producing individual shot or balls, and then bringing a second mould half at high speed into engagement with the first mould half. The first mould half shall be filled to an extent such that a coherent body in the form of a single shot or a single ball will be formed when the mould halves meet.

It will be evident from the aforegoing that the present invention solves the problems mentioned in the introduction originating from the use of lead shot, since the aforesaid materials and substances do not create the same environmental drawbacks as those engendered by lead.

A few materials have been mentioned in the aforegoing in addition to the heavier fractions comprised of at least one of the materials WC and FeW. It will be obvious in other respects that the person skilled in this art has a wide range of materials to choose from.

The present invention shall not therefore be considered restricted to the aforedescribed exemplifying embodiments thereof, since variations can be made within the scope of the accompanying Claims.

Claims

1. A material for hunting ammunition, c h a r a c t e r i z e d in that the ammunition material comprises at least one of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form and a material of low melting point which functions to bind the powder material to a coherent body; and in that the powder material and the binder material is present in the ammunition material in such mutual proportions that the ammunition material will have a density which corresponds to or is in the same order of magnitude as the density of lead.

2. A material according to Claim 1, c h a r a c t e r i z e d in that the binder material is comprised of at least one of the materials zinc (Zn), tin (Sn) or aluminium (Al) which functions as a sintering material.

3. A material according to Claim 1 or 2, c h a r a c t e r i z e d in that ammunition material of low or average density comprises tungsten carbide and zinc, preferably in about equal volumes.

4. A material according to Claim 1 or 2, c h a r a c t e r i z e d in that high density ammunition material comprises ferrotungsten and zinc in proportions of preferably about 75 vol. % FeW and 25 vol. % Zn.

5. A material according to Claim 1, c h a r a c t e r i z e d in that the binder material is a plastic material, preferably a polyester plastic.

6. A method for producing a material for hunting ammunition, c h a r a c t e r i z e d in that the ammunition material is produced by mixing at least one

of the materials tungsten carbide (WC) or ferrotungsten (FeW) in powder form with a material of low melting point, causing the material of low melting point to melt and then solidify so as to cause the last-mentioned material to sinter together the powder material; and in that the powder material and the sintering material are mixed in such mutual proportions that the ammunition material will have a density which corresponds to or is in the same order of magnitude as the density of lead.

7. A method according to Claim 6, c h a r a c t e r i z e d in that the sintering material is comprised of at least one of the materials zinc (Zn), tin (Sn) or aluminium (Al).

8. A method according to Claim 6 or 7, c h a r a c t e r i z e d by including tungsten carbide and zinc, preferably in about equal volumes in the ammunition material of low or average density.

9. A method according to Claim 6 or 7, c h a r a c t e r i z e d in that ferrotungsten and zinc is included in ammunition material of high density, preferably in proportions of about 75 vol. % FeW and 25 vol. % Zn.

10. A method according to Claim 6, 7, 8 or 9, c h a r a c t e r i z e d by subjecting the mixture of powder material and sintering material to a high speed moulding process such that an adiabatic process will occur where the sintering material melts.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 93/00950

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: F42B 7/04, F42B 12/74
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: F42B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4881465 (R.C. HOPPER ET AL), 21 November 1989 (21.11.89), the whole document	1-2,6-7
Y	--	5
Y	GB, A, 2200976 (WILMET LTD), 17 August 1988 (17.08.88), the whole document	5
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A	GB, A, 697172 (THE BIRMINGHAM SMALL ARMS COMPANY LIMITED), 16 Sept 1953 (16.09.53), the whole document	1-10
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

30/12/93

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4881465	21/11/89	NONE	
GB-A- 2200976	17/08/88	GB-A,B- 2149067	05/06/85
		US-A- 4780981	01/11/88
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GB-A- 697172	16/09/53	NONE	